

PANEL JACKS EML 101  
(Listed from left to right)

(Arrows down - inputs; arrows up - outputs)

KEYBOARD

- + VOLTS (output) - Constant voltage source; stereo output, +10 V, -10 V, nominal.
- Glide (input) - Used with optional 101 foot switch for turning glide on and off.
- Gate (output) - A voltage source of approximately 15 volts which is "turned on" for every key depression. When a key is depressed, the GATE VOLTAGE immediately goes to +15 V and will remain at that level for as long as the key is "down".

The GATE may be used to initiate envelopes of the 101, "step" a Sampler, initiate external add-on control functions (Envelope, Sampler, Sequencer) of the EML 200, EML 401 module, and EML 400 Series Sequencer.

- CM 2 (output) - Keyboard 1 control voltage  
Lowest key - 4.4 volts (+10%)  
Highest key - 8.8 volts (+10%)  
*decimal point  
comp. should be 0.44 - 0.88  
0.5v - 6v. nominal*
- Sequencer (input) - EML 400 Series Sequencer quantized, exponential, or linear voltage input for pitch control of Oscillators 3 and 4. Oscillator 3 must be in the KB2 mode, Oscillator 4 in CM3 mode.

OSCILLATOR CONTROL MIXER

- External (input) - Used to introduce external control voltage sources into the oscillator control mixer. Patching an external control source into EXT, negates the presence of Oscillator 4 in this mixer. Oscillator 4 being replaced by the new control source. Turning the lower "pot" counterclockwise determines "how much" of the new control source signal will be in the mixer.
- Output - The mix of control voltages is outputted at this jack. If the "pots" in the MIXER block are both set to zero nothing will be outputted. (i.e. If the uppermost "pot" is set to 9 o'clock and the lower "pot" set to 2 o'clock, the proportional mix of the control voltages from Oscillator 1 and Sampler will be present at the output.)

### OSCILLATOR 1

- External (input) - Used to introduce external control voltage sources to control the frequency-pitch of Osc. 1. CM1 of Osc. 1 must be in the Osc. 4/Ext position for an external voltage to affect Osc. 1. Osc. 4 will be negated and replaced by the new control signal. The control sensitivity "pot" will determine "how much" the new control signal will affect Osc. 1.
- Output - Output of Oscillator 1 allows it to be used as a source oscillator (CM2 position of the CM1 switch) by patching it into the Filter Input Mixer Ext. jack; or as a control oscillator by patching it to external control voltage inputs located throughout the audio path of the EML 101.

### OSCILLATOR 2

- Output - Oscillator 2 can be outputted from this point to be used as a control oscillator or to bypass the filter and/or modulator/amplitude shaper. (Voltage Controlled Amplifier)

### OSCILLATOR 3

- Output - (Same as Osc. 2.)

### OSCILLATOR 4

- Output - (Same as Oscillators 2 and 3.)

### MULTIPLE

- (Input and/or Output) - Passive Mixer - Used to "multiply" a signal or signals. (i.e. inputting one signal into the MULTIPLE provides three outputs of the same signal.)

### NOISE

- (Output) - White Noise Source.

### FILTER INPUT MIXER-

An external input for bringing a signal into the Filter Input Mixer which introduces a mixed signal to the voltage controlled filter. Patching a signal into the Ext. jack negates Noise at the "pot" marked Noise/Ext., the "pot" will then control the volume of the external signal in the mix.

- Output - The mix set in the Filter Input Mixer is available at this output for use as desired.

### FILTER CONTROL MIXER

- External (Input) - Same as the Oscillator Control Mixer.

- Output - Same as the output of Oscillator Control Mixer, only in addition, to Osc. 1, Env. 2, Osc. 4/Ext, and the Sampler Control voltages; the logized KB1 control voltage or logized KB2 control voltage can also be placed in the mix.

FILTER (input) - Inputting an external signal into the Filter blocks the signal from the Filter Input Mixer. The external signal inputted will be the only signal filtered.

(output) - The output of the filtered (modified) signal.

SAMPLER TRIGGER

(input) - External trigger input for "stepping" (voltage controlling) the Sampler oscillator once for every trigger pulse.

(output) - Output of the Sampler oscillator. The Sampler oscillator produces a pulse waveshape and its frequency range is .2Hz to 40 Hz.

ENVELOPES

Trigger (input) - Inputting a proper trigger source (sub-audio oscillator, keyboard gate, sampler trigger out, etc.) will initiate Envelope 2. There is a "level detector" on the input of the Envelope Trigger which allows you to delay initiating Envelope 2, by inputting a voltage that increases over time, when the "trigger level" is reached, Env. 2 will start.

ENV. 1 (output) - Voltage output of the Envelope 1. The characteristics of the voltage are determined by the attack, decay, and sustain controls of Envelope 1.

ENV. 2 (output) - Same as Envelope 1.

MODULATOR/AMPLITUDE SHAPER

AUDIO (input) - Introduction of audio signals directly into the Modulator/Amplitude Shaper without Filter modification. Inputting a signal into this jack blocks the signal flow from the Filter into the Modulator/Amplitude Shaper.

MOD. (input) - This input is implemented when another modulation signal is desired other than Oscillator 4. Inputting a signal here negates Oscillator 4 as the modulation signal.

ENV. (input) - An external voltage may be used as an "envelope" to control the voltage control amplifier (amplitude shaper).

OUTPUT (output) - Output of the modulated/amplitude shaped signal.

PREAMP (input) - Used to boost low level external signals to an adequate, workable level.

(output) - Output of the boosted external signal, may be taken from this point and inputted to the Filter or Modulator for modification.

## OUTPUT MIXER

- EXT. (Input) - Input for external signal. Volume is controlled by EXT "pot" in Output Mixer section.
- HI (Output) - High level outputs used for connecting synthesizer to hi-fi stereo type amplifiers.
- LO (Output) - Low level output for connecting synthesizer to guitar type amplifier.

## 100 AND 101 KEYBOARD CLEANING PROCEDURE

### Keyboard Removal -

1. Remove all 5 pan-head screws and 3 woodscrews from bottom of case. Note where they went.
2. Remove the two screws from the top keyboard brace.
3. Remove the brace (it may be in tight) and carefully lift out the keyboard.

### Cleaning -

1. Rest the keyboard on its back edge, front end of keys pointing up, spring contacts facing you.
2. Press a key and notice the action that takes place. A clear plastic bar moves up pulling with it the ends of two gold springs against two gold buss bars. Sometimes dirt accumulates at the point where the spring touches the buss bar causing erratic pitch variations and/or multiple triggering of the envelope generators (or none at all) during a single key stroke. The top row of contacts relate to pitch voltage, and the bottom row triggers the envelopes and keyboard sampling circuitry.
3. When handling the contacts, extreme care must be taken not to stretch or in any way deform the springs. Dirt can be removed from springs and buss bars at the point of contact by using the end of a pipe cleaner moistened with TV tuner and control spray cleaner or tape recorder head cleaner. Very carefully swab the contact area and when finished, make sure the clear bar is resting vertically and not turned to one side.
4. Notice that when a key is not pressed, the lower spring is resting against a buss that is not used electrically and cleaning this lower buss is not necessary.

### Special Problems -

1. If thorough cleaning of a particular keys contacts does not remedy the problem, here are some probable causes:

On a particular key only -

Envelopes trigger intermittantly or not at all and no new pitch is heard

(Check the solder connections directly below the defective key)

One last note on keyboard problems -

KB2 voltage will be unstable if the keyboard plug is not making good contact with the socket on the front panel. This is usually caused by dirt and oxide in the socket and can be cleaned by inserting a pipe cleaner end moistened with the cleaners mentioned earlier into each hole in the socket and scrubbing thoroughly. Do this with the system unplugged from power of course.

Re-installing keyboard -

Gently put the keyboard into the box and install the five bottom screws. If there were three washers along the front between the keyboard and case, make sure they are in place first. Position the wood brace along the top and install the two top screws and the three bottom wood screws.

ALIGNMENT PROCEDURE FOR EML-101 (AFTER S/N 300)

- WARNING:
1. The system must be operating functionally prior to any adjustments.
  2. Internal adjustments not performed by the factory are discouraged.

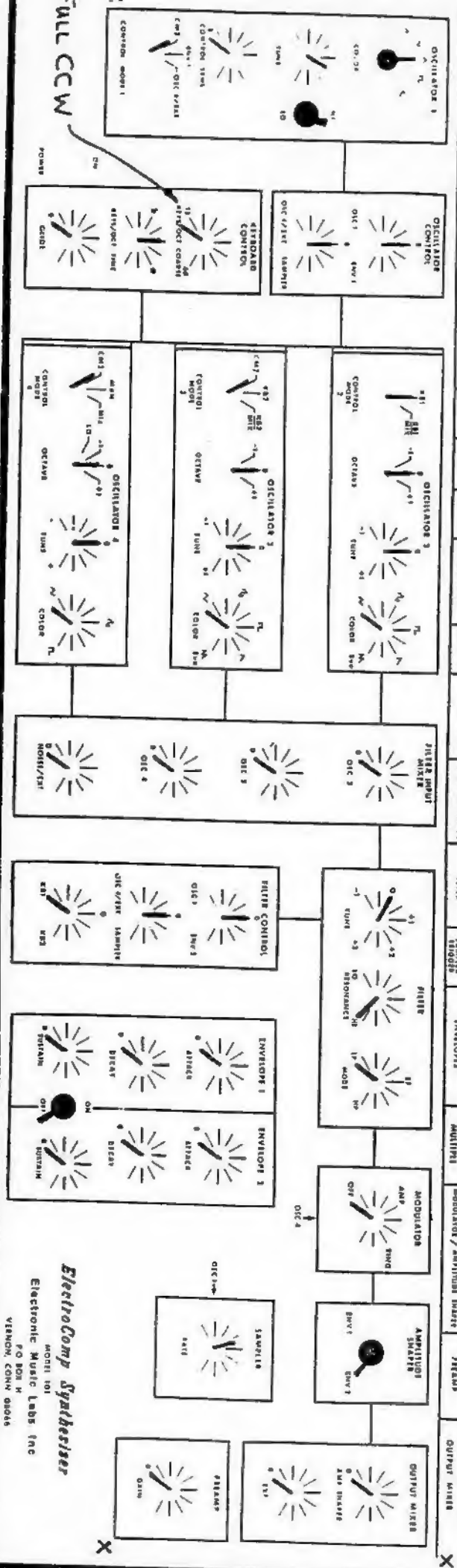
EQUIPMENT NEEDED:

1. Scope - capable of X-Y display  
DC - coupled vertical amplifier  
1 mV/div. sensitivity
2. Frequency counter (Heath IB-101 typical) or;  
frequency standard w/87.3 hz & 1046.5 hz or 440.0 hz or;  
Strob-o-tuner.
3. 3/32" Allen wrench (for panel screws before S/N 900)
4. Key wedge

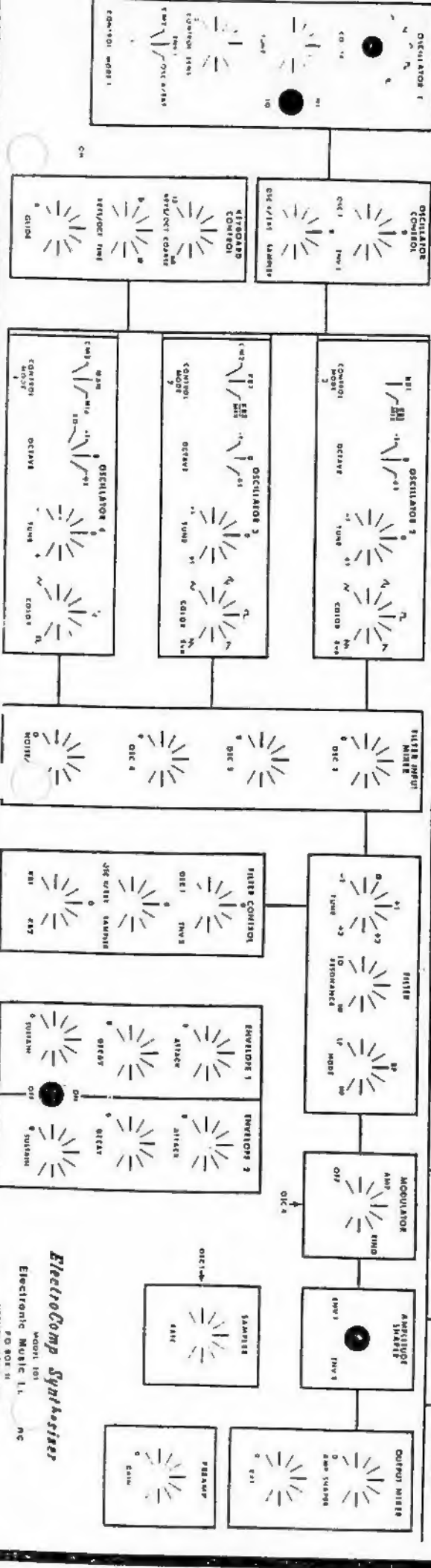
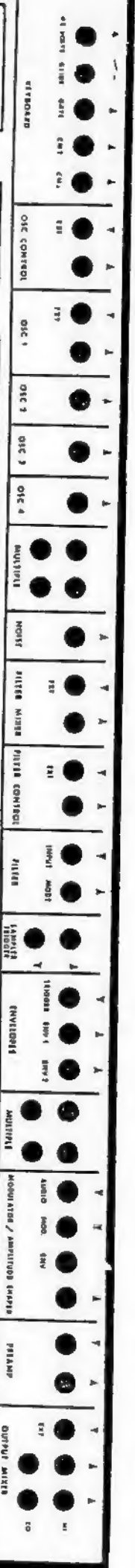
PROCEDURE OUTLINE:

- I Knob settings & panel removal
- II Oscillator 2 linearity
- III Keyboard tuning (KB-1)
- IV Oscillator tracking and KB-2 tuning
- V Filter tuning
- VI Filter tracking and AC null
- VII VCA thump null





**ElectroComp Synthesizer**  
 Electronic Music Labs Inc  
 PO BOX 11  
 VERNON, CONN 06066



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## I. KNOB SETTINGS AND PANEL REMOVAL

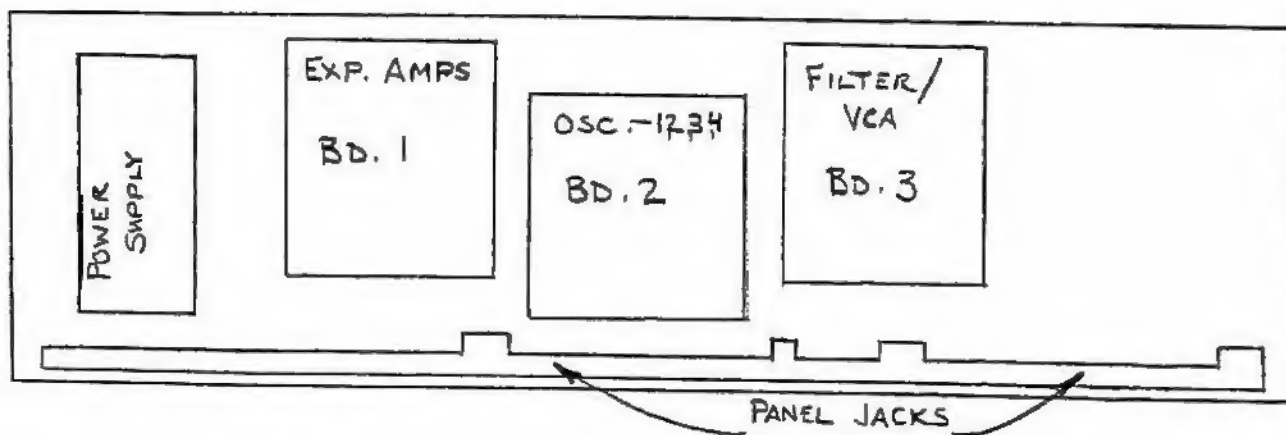
Set knobs as shown in diagram.

Remove 5 Allen screws (marked X on panel facsimile) from front panel. Note; after S/N 900 panel screws are philips head.

Pull right side out about 2", and slide panel to right.

Be careful not to break oscillator 1 "color" switch.

Familiarize yourself with the backside of the panel.



BACKSIDE VIEW OF PANEL

### POWER SUPPLY

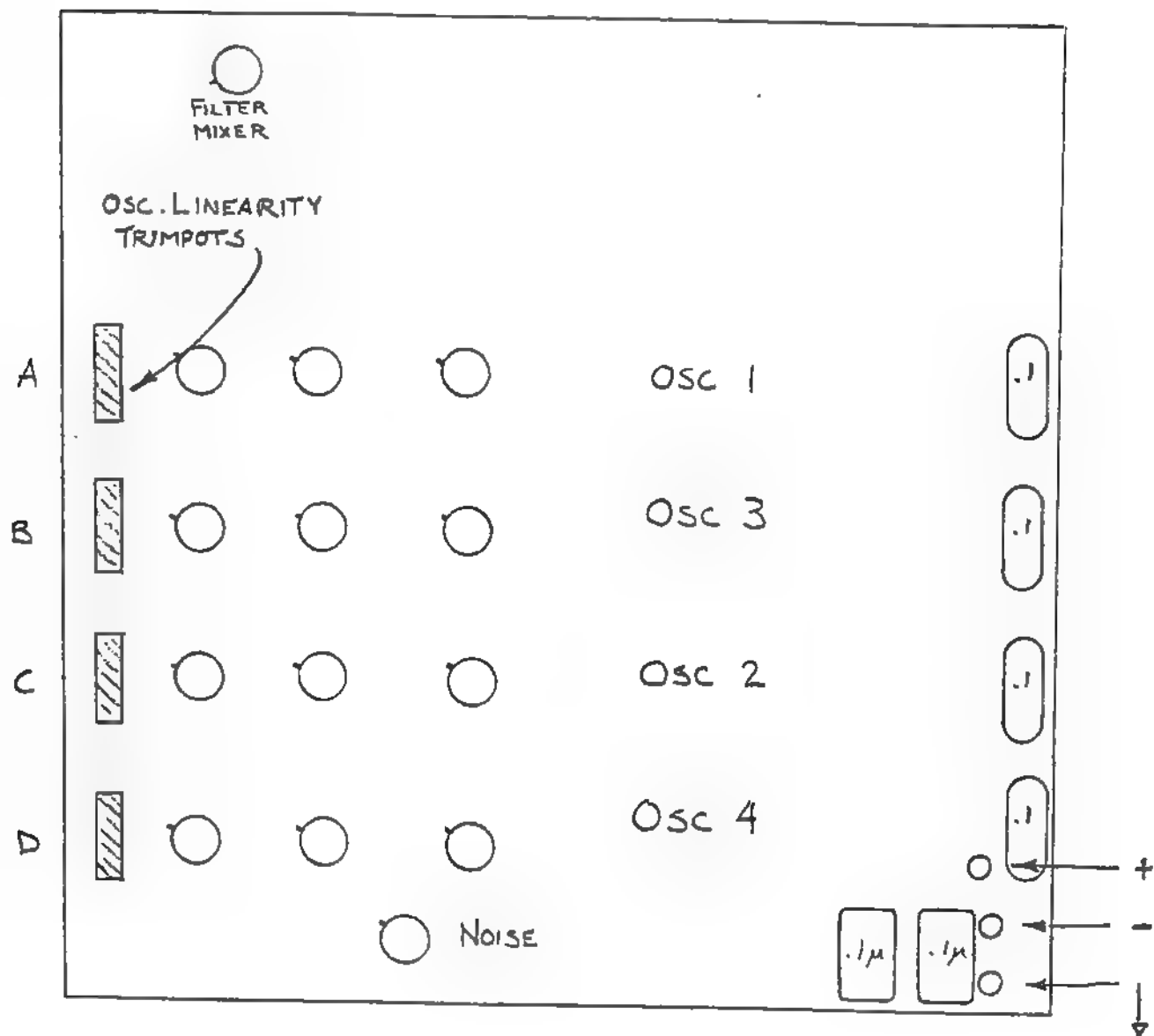
+15 V (RED)

-15 V (BLUE)

GND. (BLACK)

## II OSCILLATOR 2 LINEARITY

Familiarize yourself with the oscillator board layout.



OSCILLATOR BOARD #2

If you have a frequency counter, connect it to oscillator 2 output jack. Be certain to let the counter warm-up; and when taking a reading, let the display stabilize.

If you have a standard (87.3/1046.5 hz or 440.0 hz) - connect it to the horizontal amplifier of your scope. Connect the vertical Amp to Osc. 2 output jack.

If you have a strobotuner - direct connection to Osc. 2 is possible, but you can patch Osc. 2 into an amplifier and use the tuner's Mic.

Allow the synthesizer to warm-up at least 30 minutes before making any adjustments.

Hold the low key (F note) and adjust Osc. 2 tune knob to 87.3 hz. Release low key and hold high key (C note) down. Use the "keys/oct fine" knob to produce 1046.5 hz.

CHECK OCTAVE INTERVALS: THESE SHOULD BE -

<u>Keyboard</u>	<u>C Note</u>	<u>F Note</u>	<u>A Note</u>
Highest	1046.5	698.5	880.0
	523.2	349.2	440.0
	261.6	174.6	220.0
Lowest	130.8	87.3 hz	110.0

If the upper end of the keyboard is not linear (greatest error is usually in the upper end); hold the highest F note which should be 698.5 hz. If the error is within  $\pm 4.0$  hz; it may be best to leave it alone, the linearity could be acceptable. However, most units can be made linear to  $\pm 1.0$  hz.

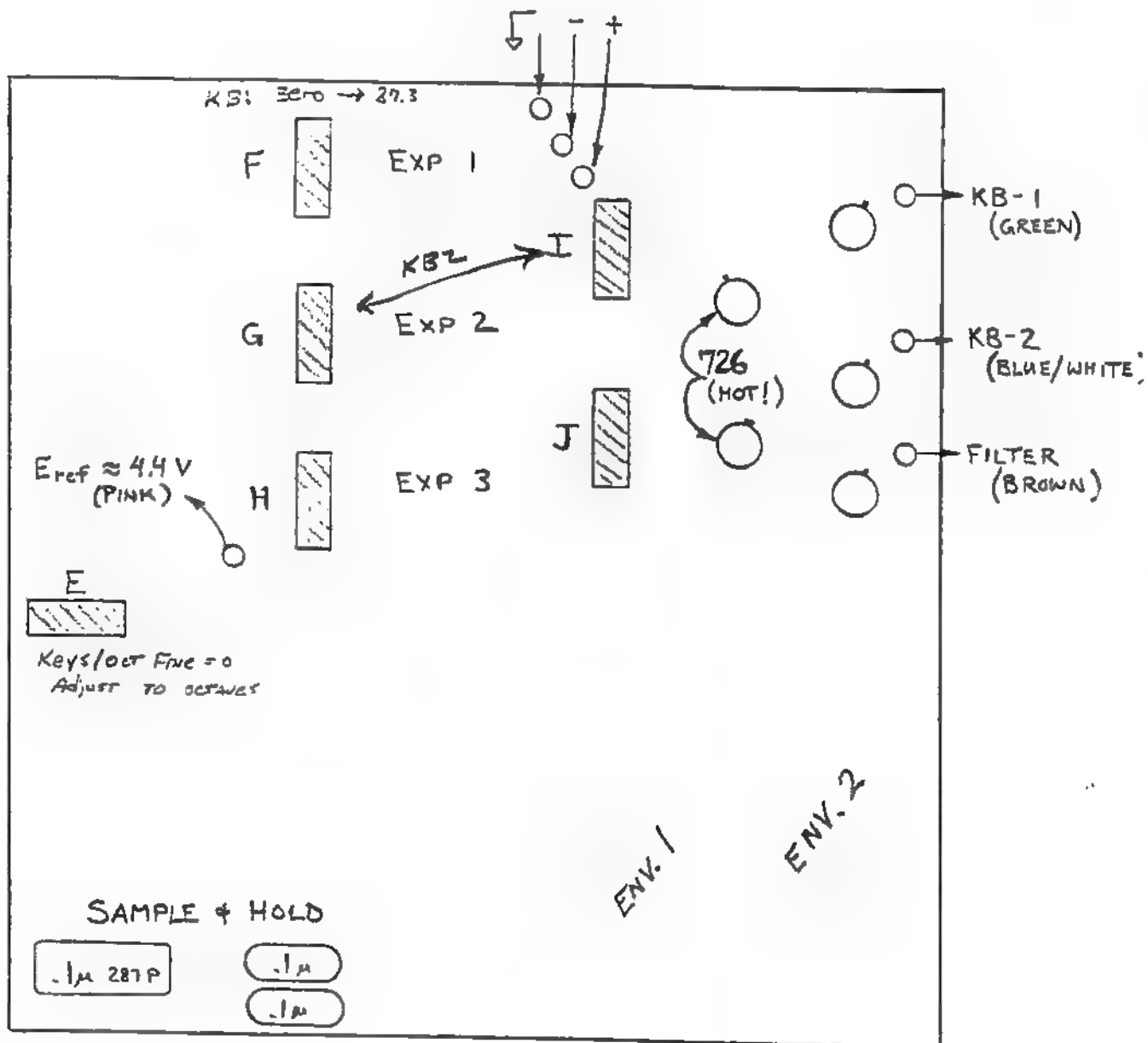
To improve linearity use the blue trimpot C on board 2. Move to increase the error of the F note.

Now - repeat above procedure; hold low F - tune oscillator 2 to 87.3 - hold high C - fine octavation to 1046.5, again check octaves. Repeat trimpot adjustment and retuning until oscillator 2 is linear.

Note - If you are using a single frequency standard such as "A" 440.0 - the linearity adjustment may not improve as the lower octave "A" has its error increased. You will have to experiment with adjustments to trimpot C to achieve best linearity.

### III. KEYBOARD TUNING (KB-1)

Familiarize yourself with the Exp. Amp board layout.



EXP. AMP/ENV. GENERATOR - BOARD 1

Check all oscillator tune knobs to be sure they are rotation centered on pot shafts. If not, position and tighten.

Set oscillator 2 tune and key/oct fine to "zero". Hold low F key and adjust blue trimpot F for 87.3. Then hold high C and adjust blue trimpot E for 1046.5.

Oscillator 2 should now be tuned and linear. You will no longer need the counter or standard.

#### IV. (A) OSCILLATOR TRACKING

With vertical amp of scope on oscillator 2 connect horizontal amp. to oscillator 3 (verify CM-3 switch is in CM-2 position). Hold high C and tune oscillator 3 to standstill display.

Hold low F and adjust trimpot B to stop any roll. Retune high C and recheck low F. Oscillator 3 should now track with oscillator 2.

Repeat above steps for oscillator 4 (using trimpot D) and oscillator 1 (using trimpot A).

#### IV (B) KB-2 TUNING

With scope display Osc. 2 vs. Osc. 3, tuned to high C standstill; switch Osc. 3 to follow KB-2. Hold high C, adjust trimpot I for a standstill pattern.

Hold low F, adjust trimpot G for a standstill. Readjust I for high C - repeat low F and high C adjustments until keyboard is standstill for any note. KB-2 now tracks KB-1 and there should be little or no change when Osc. 3 is switched from CM-2 to KB-2.

NOTE - Overshooting the adjustment of trimpot G (for low F) will speed up the tuning.

## V. FILTER TUNING

Disconnect the brown wire from filter Exp. Amp on board 1 and pull the blue/white wire from KB-2. Push the blue/white wire onto the filter pin.

With oscillator 2 on KB-1 switch to -1 octave and oscillator 3 on KB-2 switch to +1 octave.

Using the same procedure for tuning KB-2; use trimpot J for high C standstill and trimpot H for low F standstill.

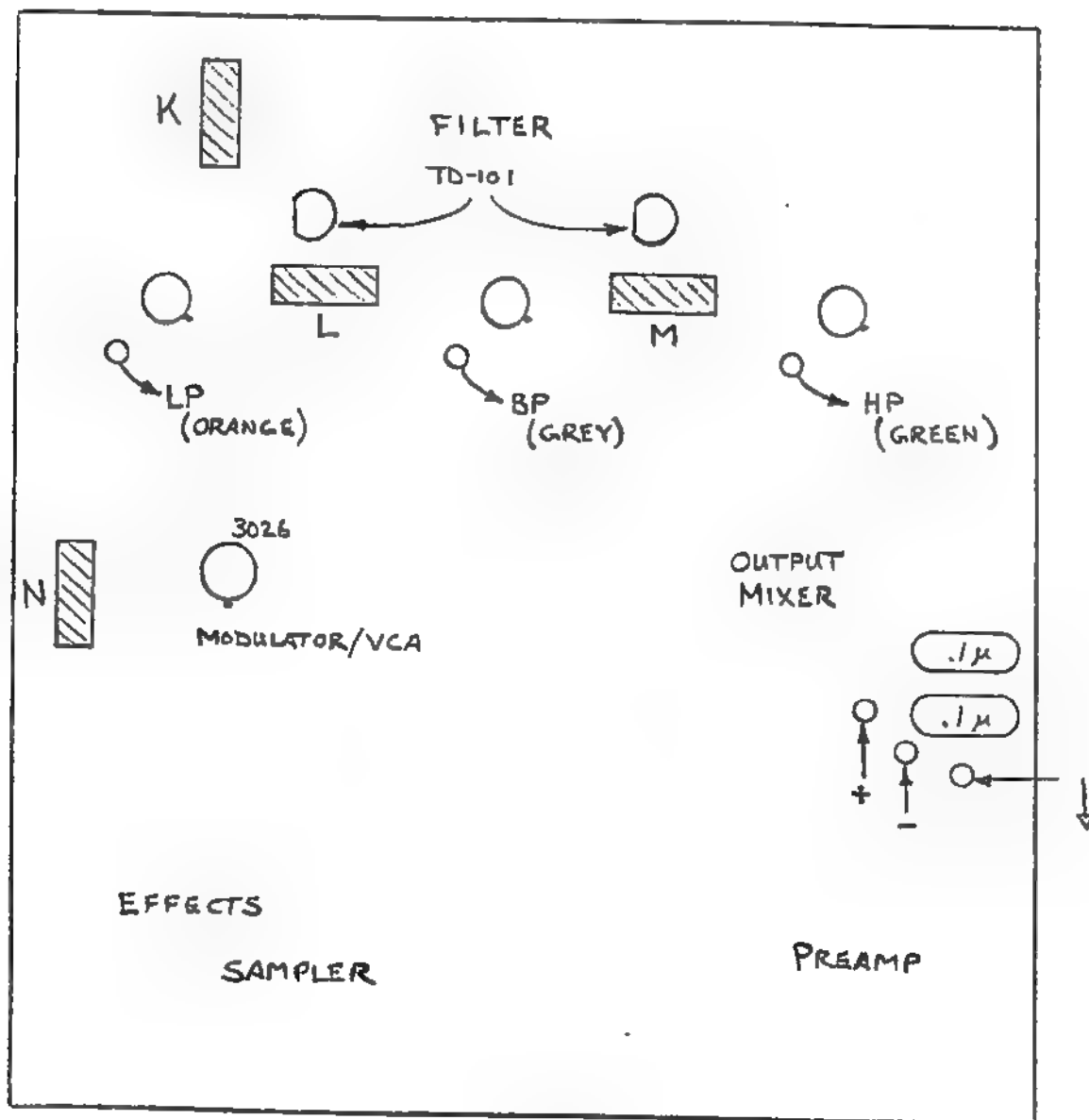
Filter drive should now follow the keyboard.

Reconnect the blue/white wire to KB-2 pin, and the brown wire to filter pin.



## VI. FILTER TRACKING AND AC NULL

Familiarize yourself with filter board layout.




FILTER/VCA - BOARD 3

Set scope to .5 V/div. vertical sensitivity and about 2 msec/div. horizontal display. Connect vertical input to filter output.

Turn Osc. 2 filter input mixer level knob about  $\frac{1}{2}$  way. Strike high C and use filter tune knob to peak signal (should be near "0" if Osc. 2 is on zero octave). Adjust level for 4 div. peak-to-peak display.

Strike low F, adjust trimpot K for peak. Strike high C, repeak filter tune. Slide up and down keyboard - signal should not dip or shift DC level more than 50%. If so, check first for 748 op amp scream (look at HP, BP, and LP pins with scope @ 20 mV/div, and no signal into filter). Then check TD-101 devices for failure.

Switch Osc. 2 through -1, 0, +1 octaves and check for reasonable tune peaks and tracking levels of filter.

Turn Osc. 2 input level off (no signal), with filter tune on "0" peak turn reasonance to Lo (full counterclockwise). Switch Osc. 1 to square () and filter control to full Osc. 1.

With scope on .1 V/div. look at LP pin (orange wire), adjust trimpot L for minimum signal. Now look at HP pin (green wire), adjust trimpot M for minimum signal.

Repeat until upper end of keyboard is best nulled. Some increase in level toward lower octaves is normal.

Filter should be tuned, tracking and nulled.

## VII. VCA THUMP NULL

Turn Osc. 1 off of filter control (still no signal). Set all envelope controls to minimum (full ccw) for spike.

With scope still on .1 V/div. look at modulator/amp shaper output.

Rapidly pulse a key with a finger, adjust trimpot N for minimum spike.

You should be able to have a straight line at .1 V/div.

All adjustments are complete on EML-101.

### USING YOUR WHEEL

The EML wheel has the exclusive feature of controlling two inputs with the same wheel.

The patch cord set includes:

- 1 stereo to stereo cord
- 1 stereo to 2 mono cords.

The stereo to stereo cord is used with the voltage out jack on your 101.

Patching from the voltage output jack on the 101 panel to the left jack on the wheel panel will allow you to get a (+) positive voltage out of the right jack on the wheel panel when the wheel is rotated toward the 101 panel and a (-) negative voltage when the wheel is rotated away from the 101 panel. This voltage can be used for any number of operations including: pitch bend, filter wah, and volume control (VCA). Route the right jack on the wheel panel with a mono to mono cord to any external control input on the 101.

The stereo to 2 mono cords is used when other control sources are needed. By placing the stereo plug in the left wheel panel jack the remaining mono cords allow you two control functions which will operate with the wheel. The mono plug with black tape will be controlled when the wheel is rotated toward the 101 panel. The other mono plug will be controlled when the wheel is rotated away from the 101 panel. These mono plugs can be patched from any number of functions including: vibrato oscillator, envelopes, voltage (mono plug in the voltage jack on the 101 will give (+) positive voltage only). The right jack on the wheel panel is the output and can be routed to any Ext. control input on the 101 using a mono to mono cord.

Electronic music  
laboratories, inc.

P.O. Box H, Vernon, Connecticut 06066 Tel: (203) 875-0751

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TO JON HOPPE,

EML-101 S/N 294

YOUR SYNTHESIZER IS IN TOP CONDITION. THANK YOU  
FOR A GOOD, WELL DEFINED PROBLEM LIST; IT REALLY HELPS!

AS REGARDS FULL KEYBOARD TUNE AND TWO NOTE  
INTERVALS:

OSCILLATOR TRACKING WITH ANOTHER FIXED PITCH KEYBD.  
(YOUR HAMMOND) WILL BE VERY GOOD IN "0" OCTAVE. HOWEVER,  
GETTING ALL OSCILLATORS (1 THRU 4) TO MAINTAIN HARMONIOUS  
TRACKING WITH EACH OTHER OVER THE KBD. RANGE IN DIFFERENT  
OCTAVES IS A DIFFERENT STORY — I EXPERIMENTED WITH  
THE 16', 8', 4', & 2' COMBINATIONS ABOUT 2 HRS. & HAVE  
ENCLOSED SOME FAX SHEETS W/ REGISTRATIONS.

BASICALLY — THE OSCILLATOR CIRCUIT HAS ONLY ONE ADJUST-  
MENT FOR LINEARITY (ABILITY TO TRACK EACH OTHER). TO ASSURE  
BEST OVERALL RESULTS, ALIGNMENT IS DONE IN "0" OCTAVE  
AND TUNE CONDITIONS. SINCE MAXIMUM NON-LINEARITY USUALLY  
OCCURS AT HIGHER PITCH (HIGH END OF KB.), OCTAVE SWITCHING  
CORRECTION WAS CALCULATED FOR HI "C" KEY ERRORS.

THE WORST COMBINATION IS SWITCHING AN OSC. TO "+1"  
OCTAVE AND "+1" TUNE.

IF YOU CAN USE A SAWTOOTH WAVE, TRY GOING  
TO DOUBLE SAW ("COLOR") TO GO UP AN OCTAVE. THIS IS  
EXACT AND WILL NOT AFFECT TRACKING.

NEXT, GO UP AN OCTAVE WITH THE "TUNE" CONTROL.  
THIS SHIFT CAUSES MINIMUM BEATING.

TUNING HINTS — FORGIVE ME IF I'M TELLING YOU STUFF YOU ALREADY KNOW.

AFTER LETTING 101 WARM-UP ABOUT 15 MINUTES, TUNE OSC 2 TO YOUR STD. KEYBD. — HOLDING LOW "F" KEY (OCT. "SW. @ "0") USE OSC 2 "TUNE" FOR ZERO BEAT W/ ORGAN "F" — THEN HOLD HIGH "C" KEY AND USE "KEYS/OCT FINE" TO ADJUST TO ORGAN "C" NOTE. OSC. 2 SHOULD TRACK WITH ORGAN.

OSCILLATORS THAT WILL GO LOWER THAN "0" OCTAVE, 16' OR 32', WILL NOT BE A PROBLEM. USUALLY, HOLDING HI "C" KEY AND USING THAT OSC'S. "TUNE" FOR A ZERO BEAT WILL BE EASY. STILL, ADJUST CAREFULLY FOR A HARMONIOUS BLEND.

TO HAVE ONE OR TWO OSCILLATORS ABOVE "0" OCTAVE (4' OR 2') TRY TO USE THE DOUBLE SAW(M) ON THE "COLOR" FIRST, THEN THE "TUNE". THE BEST RESULTS USUALLY OCCUR WITH HOLDING THE "E" OR "F" KEY IN THE HIGHEST KEYBD. OCTAVE, TO TUNE TO ZERO BEAT (OR DESIRED ROLL).

IF YOU HAVE TO USE BOTH "TUNE" AND "OCTAVE" AT "+1" — VERY CAREFULL TUNING IS REQUIRED.

TRY ANY OF THE COMBINATIONS TO GET BEST RESULTS.

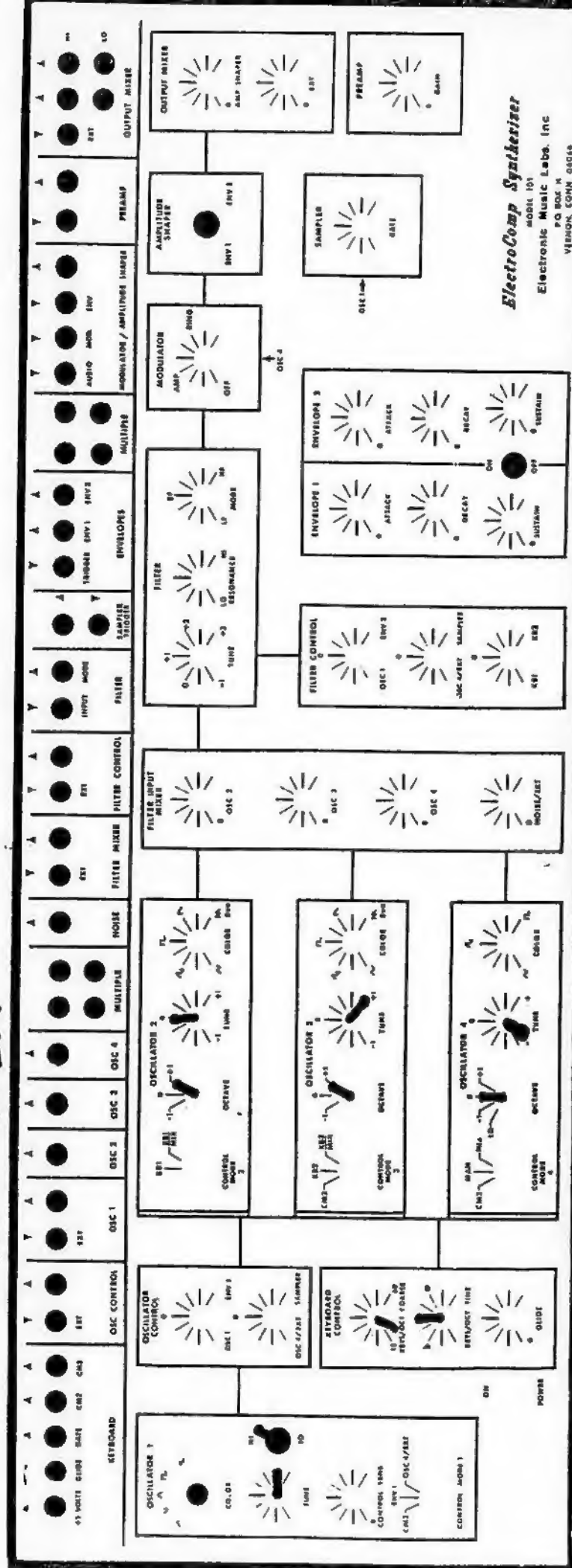
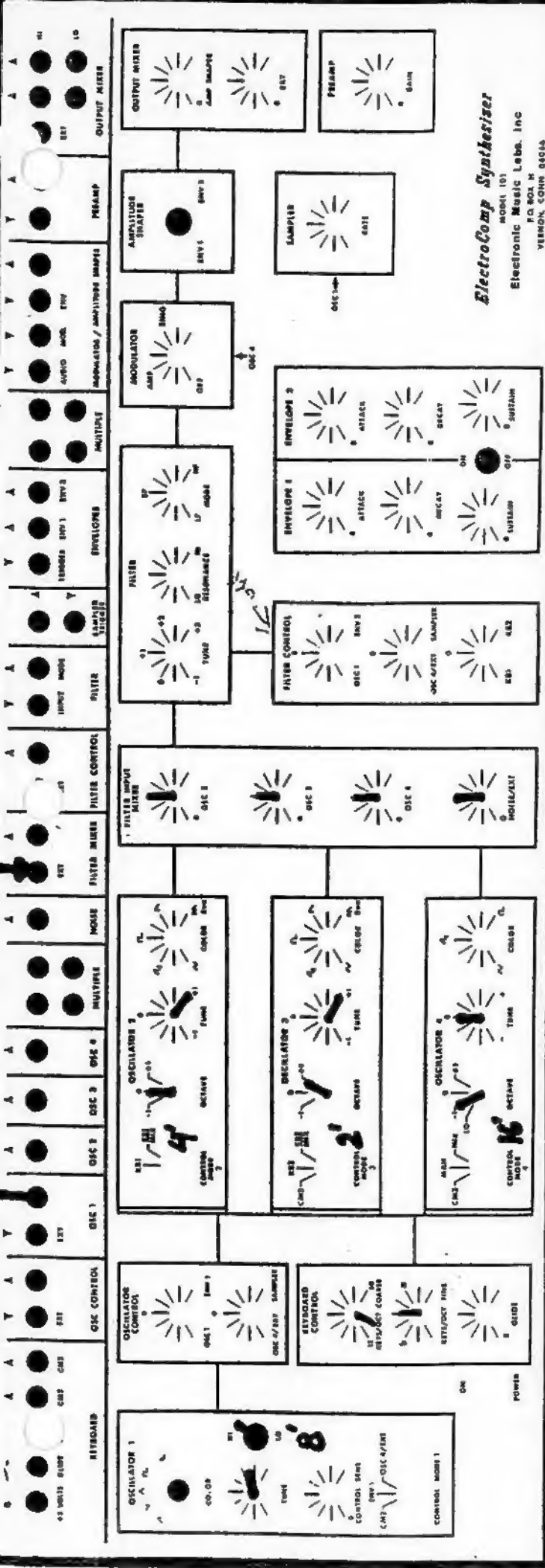
WHEN USING OSC. 3 AND 4 TO FOLLOW HIGH NOTE (KB-2) THE INSTRUMENT GIVES LITTLE OR NO PITCH SHIFT ON MODE CHANGE, AND OCTAVE SPANS ARE GOOD. YOUR 101 DOES HAVE MORE INTERVAL BEATING ESPECIALLY IN THE HIGHEST KEYBOARD OCTAVE, THAT CANNOT BE IMPROVED.

YOU WILL NOTICE (I HOPE) THAT THE INSTRUMENT IS MUCH BETTER THAN WHEN LAST USED.

IF YOU HAVE PROBLEMS OR QUESTIONS, PLEASE CALL TOLL FREE 1-800-243-7270 (OUT OF STATE).

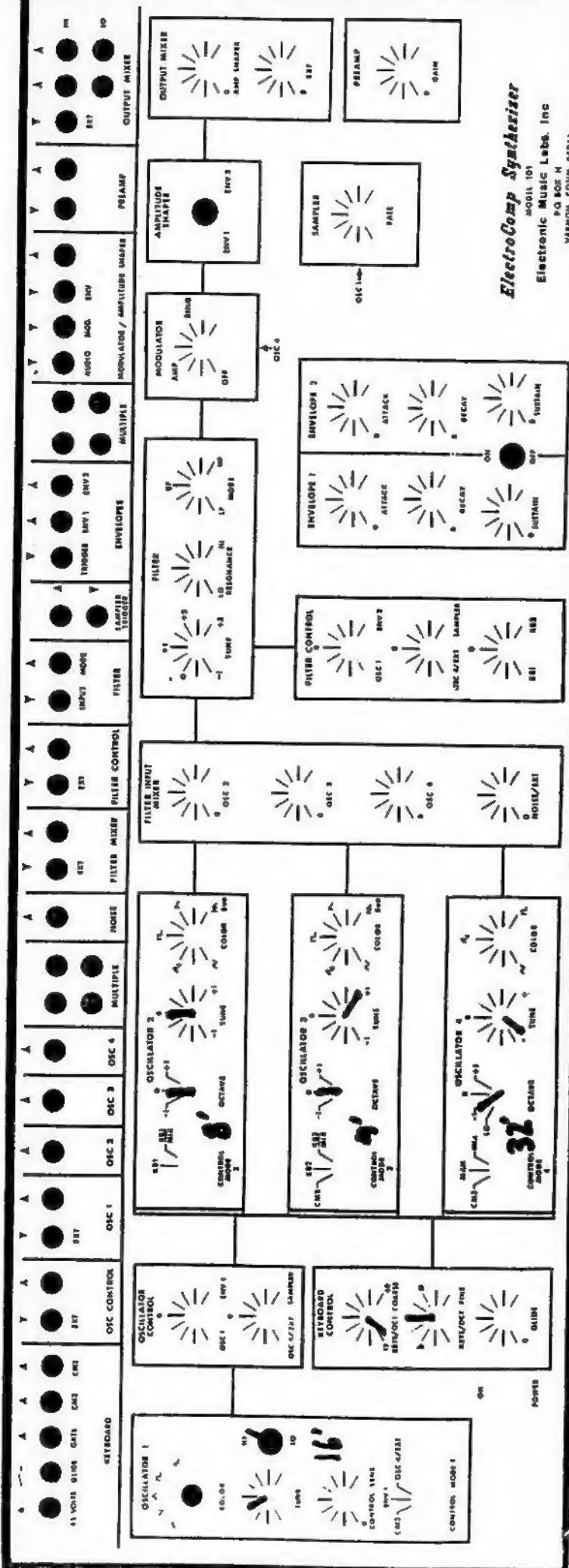
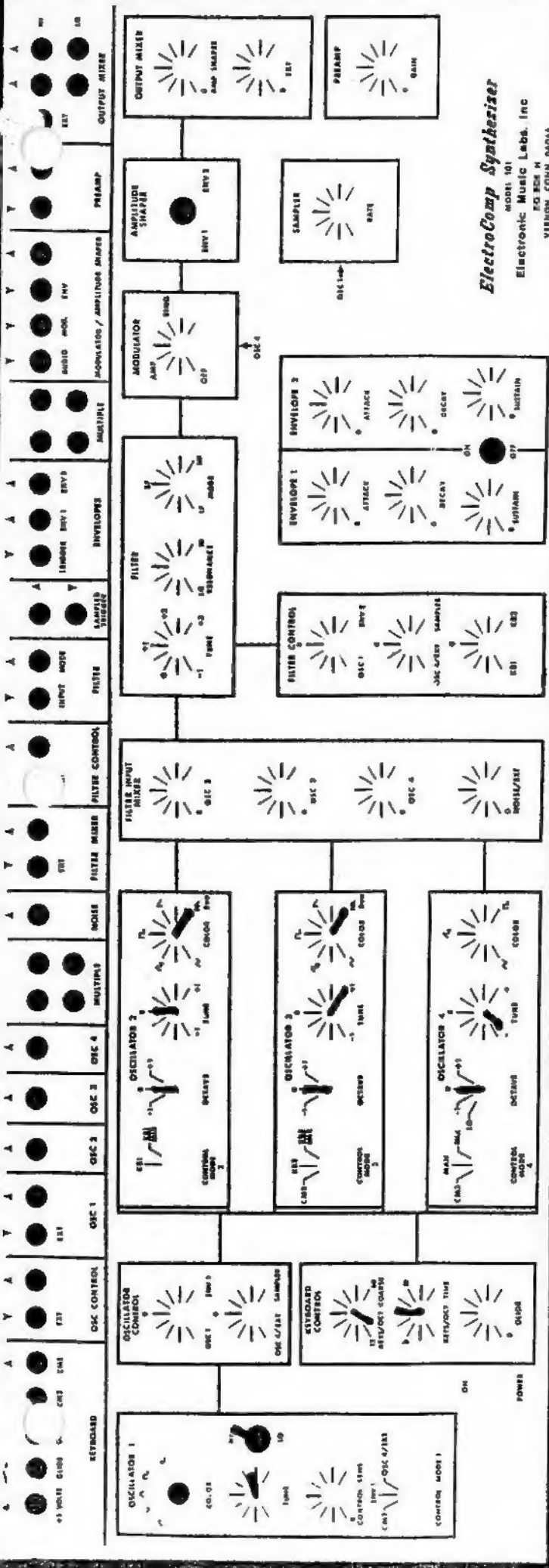
S. I WOULD LIKE TO HEAR  
IF YOU ARE SATISFIED TOO!

YOURS TRULY,  
JOHN PHELAN  
TECHNICIAN



Name \_\_\_\_\_

Date \_\_\_\_\_



Name \_\_\_\_\_ Date \_\_\_\_\_